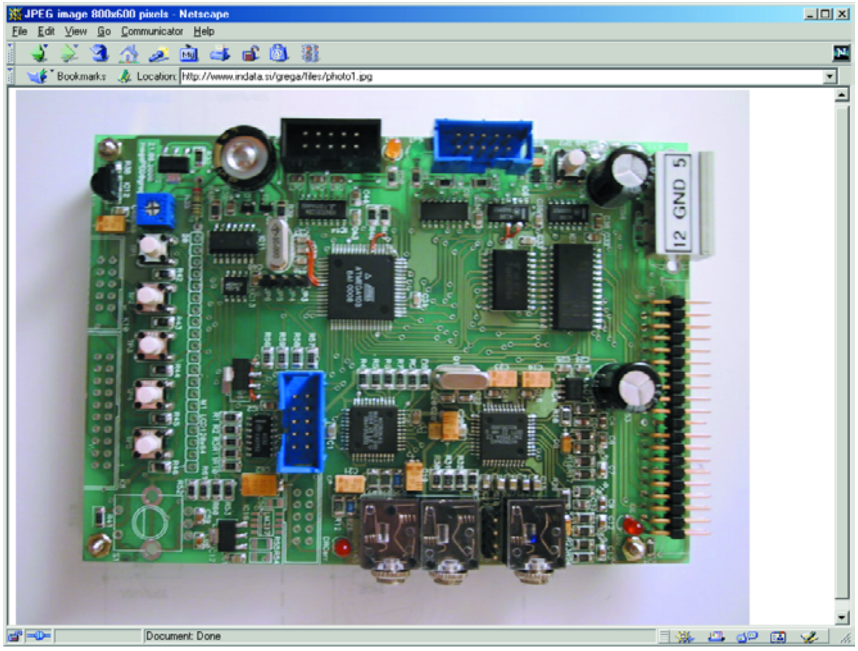
Portable MP3 Players

Smaller and with new ICs

By Harry Baggen

The MP3 format took just a few years to become an important standard in the music industry. Today, MP3 players come in many brands and models, both stand-alone and portable, with either a CD drive or a Flash memory to hold music files. Despite the wide choice of commercial units now in the shops, building an MP3 player yourself is still great fun.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It is fair to say that the MP3 format triggered a revolution in the musical industry. Thanks to MP3's enormous compression factor it became possible, for the first time, to distribute music files using the Internet and even email. But MP3 also has distinct advantages for use at home and 'on the road'. After all, a single CD-ROM has sufficient capacity to hold hours of music, while MP3 players with an internal hard disk can easily store a complete musical collection.

Admittedly this is the third time the Electronics Online column covers DIY MP3 players, but this seems justified because of the great interest in the subject. Thanks to the arrival of new MP3 decoder ICs like the VS1001 from the Finnish manufacturer **VLSI Solution** [1], designing your own MP3 player has become more attractive than ever before.

Looking at a number of projects it is clear that designers of MP3 players increasingly opt for the 'stand-alone variant' equipped with a Compact Flash memory or a 2.5-inch hard disk. Both file storage media guarantee a compact unit which, in some cases, can be called 'portable'. Indeed, some of the models referred to on these pages are so small and smartly styled that they are at least potential competitors of commercial products.

The **Super Simple pocket size MP3 player** [2] is a design based around a PIC 16LF877 from Microchip. At the heart of the circuit we found the above mentioned VS1001 chip from VLSI Solution. The memory medium is a CompactFlash card. The whole player is smaller than a cigarette box and represents a kind of bare bones design. The designer has added no 'luxury' whatsoever, even a display is conspicuously missing. None the less, the circuit is perfectly capable of playing back files stored in the Flash card while the PIC should have enough throughput to add bells and whistles.

YAMPP (yet another MP3 player) is an MP3 DIY website that's been around for a few years already. Having published his seventh design, the website author can be called industrious by all standards. The **YAMPP-7** [3] is a nice, small and portable MP3 player employing an ATMega161 controller and a VS1001 decoder IC. The design also comprises a USB interface and a Li-Ion battery charger. Just as the battery, the display has been salvaged from a GSM phone The designer offers individual components as well as ready-populated boards for this project.

Since they were first mentioned in this column (June 2001), the technical boffins behind the **MP3ar** website [4] have been very active and now present an MP3 portable sporting a 2.5-inch hard disk. The controller applied is a PIC 18C452 while the decoder chip is once again a

VS1001. A complete kit consisting of a ready-populated board, an LCD and a CD-ROM wit software can be ordered for about $100. The only item you have to add yourself is a hard disk drive.

Although Gregor Horvat's **megaPEG player** [5] design has not seen any updates for about a year, the pictures on the website show a nice design of a compact board that allows a graphic display and a hard disk to be hooked up. In his design Gregor employs an ATMega103 controller and the good old MAS3507D decoder chip.

Fallguy [6] is a universal design that can be built and extended to personal requirements for use at home, in the car, or as a portable player. The hardware consists of, among others, a 68HC912 and an STA013. An LCD with 128x64 pixels shows the track titles and operating functions. A special feature of this player is its ability to connect to two hard disk drives (master/slave) allowing access to a whopping 256 Gbytes of memory!

The Beatbox 2002 [7] is by no means a miniature-size design, but still a compact MP3 player. The size of this player is about equal to that of a 3.5-inch hard disk drive. It consists of a main board, a 2.5-inch hard disk and a large graphic display with touch-screen operation. A Motorola MC68332 processor looks after all control functions, assisted by a VS1001 decoder chip. A USB 2.0 interface ensures fast data transferring of MP3 files into the player. This player offers many functions and is compatible with various audio file formats like MPEG-1, MPEG-2 layers 1, 2 and 3, and MPEG 2.5.

The **IMAP2** player designed by David Freudenberger [8] also falls in the category 'compact but not exactly portable' and may be used with a CD drive or a hard disk. Here, too, a PIC is used for the central control functions, while the familiar MAS3507D from Micronas looks after the processing of the MP3 information.

A similar design (PCB with hard disk and display in a compact case) has been dubbed **MP3 Player** [9] by Codepuppies. Because the most recent update dates back one and a half year, constructors are well advised to check component availability before embarking on the project. The central parts in the design are a PIC and a MAS3507D.

The website **mp3projects.com** [10] was mentioned two years ago already, bit still ranks as the best source if you need an overview of all important MP3 DIY projects currently on the web. The projects overview comprises several pages and is subdivided into three main groups: stand-alone, portable and PC-hosted. For $20 the authors of the website also offer a CD-ROM containing a variety of software related to home construction of MP3 players. The offerings include datasheets, assemblers/disassemblers and PCB layout programs, as well as source code files, snippets and routines for all manner of tasks in an MP3 player.

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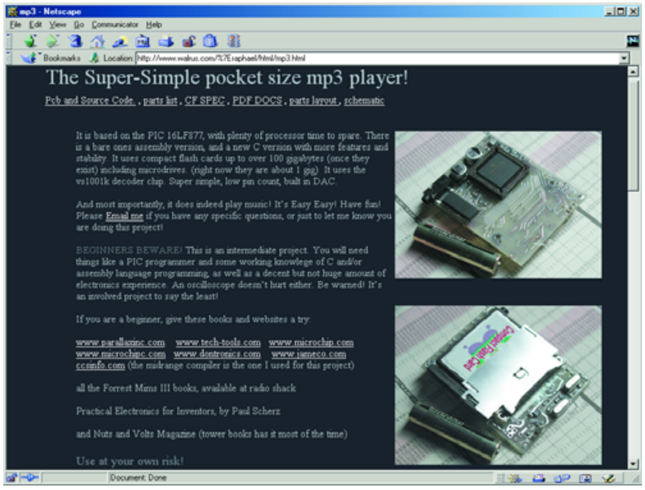
Internet adsresses

[1] VLSI Solution: *www.vlsi.fi/*
[2] Super-Simple pocket size MP3 player:
www.walrus.com/%7Eraphael/html/mp3.html
[3] YAMPP-7: *www.myplace.nu/mp3/index2.htm*
[4] MP3ar: *www.mp3ar.com/*
[5] megaPEG: *www.indata.si/grega/megapeg.htm*
[6] Fallguy: *www.loetronic.com/home-e.htm*
[7] Beatbox 2002: *www.beatbox2002.de/*
[8] IMAP2: *www.chez.com/imap3/index2_e.html*
[9] MP3 Player: *www.codepuppies.com/~ben/sens/pic/mp3/*
[10] mp3projects.com: *www.mp3projects.com/*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The Super-Simple pocket size mp3 player!

Pcb and Source Code. , parts list , CF SPEC , PDF DOCS , parts layout , schematic

It is based on the PIC 16LF877, with plenty of processor time to spare. There is a bare ones assembly version, and a new C version with more features and stability. It uses compact flash cards up to over 100 gigabytes (once they exist) including microdrives. (right now they are about 1 gig) It uses the vs1001k decoder chip. Super simple, low pin count, built in DAC.

And most importantly, it does indeed play music! It's Easy Easy! Have fun! Please Email me if you have any specific questions, or just to let me know you are doing this project!

BEGINNERS BEWARE! This is an intermediate project. You will need things like a PIC programmer and some working knowlege of C and/or assembly language programming, as well as a decent but not huge amount of electronics experience. An oscilloscope doesn't hurt either. Be warned! It's an involved project to say the least!

If you are a beginner, give these books and websites a try:

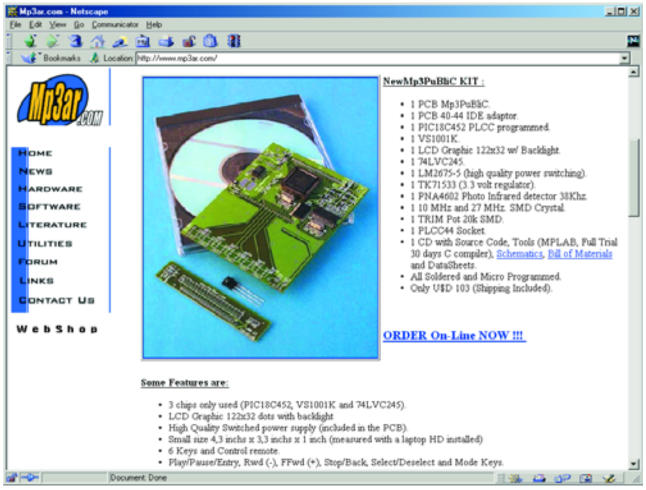
www.parallaxinc.com www.tech-tools.com www.microchip.com
www.microchipc.com www.dontronics.com www.jameco.com
ccsinfo.com (the midrange compiler is the one I used for this project)

all the Forrest Mims III books, avalable at radio shack

Practical Electronics for Inventors, by Paul Scherz

and Nuts and Volts Magazine (tower books has it most of the time)

Use at your own risk!



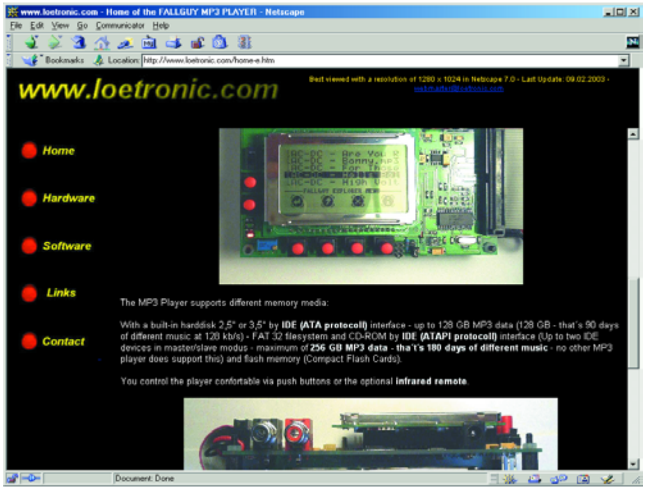
NewMp3PuBliC KIT :

- 1 PCB Mp3PuBliC.
- 1 PCB 40-44 IDE adaptor.
- 1 PIC18C452 PLCC programmed.
- 1 VS1001K.
- 1 LCD Graphic 122x32 w/ Backlight.
- 1 74LVC245.
- 1 LM2675-5 (high quality power switching).
- 1 TK71533 (3.3 volt regulator).
- 1 PNA4602 Photo Infrared detector 38Khz.
- 1 10 MHz and 27 MHz. SMD Crystal.
- 1 TRIM Pot 20k SMD.
- 1 PLCC44 Socket.
- 1 CD with Source Code, Tools (MPLAB, Full Trial 30 days C compiler), Schematics, Bill of Materials and DataSheets.
- All Soldered and Micro Programmed.
- Only U$D 103 (Shipping Included).

ORDER On-Line NOW !!!

Some Features are:

- 3 chips only used (PIC18C452, VS1001K and 74LVC245).
- LCD Graphic 122x32 dots with backlight
- High Quality Switched power supply (included in the PCB).
- Small size 4,3 inchs x 3,3 inchs x 1 inch (measured with a laptop HD installed)
- 6 Keys and Control remote.
- Play/Pause/Entry, Rwd (-), FFwd (+), Stop/Back, Select/Deselect and Mode Keys.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AC-DC - For Those
AC-DC - High Volt
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The MP3 Player supports different memory media:

With a built-in harddisk 2,5" or 3,5" by **IDE (ATA protocoll)** interface - up to 128 GB MP3 data (128 GB - that's 90 days of different music at 128 kb/s) - FAT 32 filesystem and CD-ROM by **IDE (ATAPI protocoll)** interface (Up to two IDE devices in master/slave modus - maximum of **256 GB MP3 data - tha't's 180 days of different music** - no other MP3 player does support this) and flash memory (Compact Flash Cards).

You control the player confortable via push buttons or the optional **infrared remote**.